

Toward Cross-Cultural Believability in Character Design

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INTRODUCTION.

Most of the research within the field of interactive characters has concentrated on generating guidelines or models for believable individual variability among characters, often based on psychological personality models (such as Nass, Isbister, and Lee, 2000) or biological behaviors (see e.g., Blumberg, 1994). In contrast, we ascribe to Bates' (1994) proposition that "believability will not arise from copying reality," (p. 125) and suggest that recent research discoveries (such as those documented in Reeves and Nass, 1996) point toward a different fundamental orientation in our interactions with computerized systems, given the additional cognitive processing required to maintain awareness of the mediated and created nature of the interaction.

If - as this research suggests - what is primal of our interactions with the world is our suspension of disbelief, and ascription of human-like emotions to inanimate and barely animated objects, different research dimensions and design considerations become salient. Therefore, rather than concentrating solely on creating and fostering

our users' "suspension of disbelief" through individual variability in synthetic characters, we suggest that simultaneous research efforts should explore the characteristics of breakdown moments when the deferment of questioning fails, when the "suspension of belief" is activated, so that character designers may avoid such pitfalls in the future.

Moreover, we advise that character design should expand its individual variability focus to include pursuits of cultural variability and summarize findings from existing research in cross-cultural communication that should inform the design of culturally specific characters. Characters as facilitators of cross-cultural relations and learning guides have been the focus of our research at Stanford University and Extempo Systems since 1996. Besides covering some of the applications developed, we also examine some of the success metrics for characters online that drive our work.

To that extent, we present a framework for the ten key characteristic qualities that animate characters - synthetic characters with lively autonomy and individual personas (Hayes-Roth and Doyle, 1998) - should possess, as perceived and ascribed by the interactors. These ten key qualities are: identity, backstory, appearance, content of speech, manner of speaking, manner of gesturing, emotional dynamics, social interaction patterns, role, and role dynamics (Hayes-Roth, Maldonado, Moraes, 2002). We briefly describe each before demonstrating their applicability to character

design by localizing one of Extempo's animate learning guides to three different cultures: the United States, Brazil, and Venezuela.

Before proceeding, let us present an example of how the ten characteristics of animate characters become salient during a typical interaction with one of Extempo's Learning Guides: Kyra. Kyra is an animate character with whom visitors to the Extempo web-site (www.extempo.com) may interact by typing in textual utterances. Kyra was designed by students and researchers at Stanford University's School of Education and Computer Science Department, together with Extempo Systems Inc. The original team consisted of Oceana Blueskies, Heidy Maldonado, Jim Bequette, and Karen Amano. Since then Kyra has been localized to the to the Venezuelan culture by co-author Heidy Maldonado and to the Brazilian culture by Marcia Moraes, at the Computer Science Department of the Universidade Federal do Rio Grande Do Sul in Brazil.

Kyra's mysterious background and superpowers are designed to appeal to preteens, sometimes dubbed tweens in market research, because they are in between the childhood and adolescent market segments (see Hymowitz, 1998). Kyra seeks to motivate and educate this challenging demographic on artistic expression values and art history tendencies. She presents her enlightening Quest through an Internet browser's graphic display capabilities with her gestures, textual, and spoken utterances (please see Figure 7.1 for a screenshot of Kyra's browser window).

Moreover, Kyra has a complex natural language understanding engine, mood system, and learner’s model that allow her to respond appropriately and adapt to even the most rude and stubborn students.

Figure 7.1: Picture of the Interface to Interact with Kyra¹



As she explains in her own words, Kyra will “never rest until she has conquered the invading forces from the realm of Negativity, Oppression and Ignorance who threaten to invade and contaminate our world of Art, Wisdom and Creativity.” Kyra is presented as a tween, slender but athletic, often executing martial arts maneuvers to illustrate her points, clothed in a futuristic uniform (see Fig. 7.2). However, having magical powers does not free Kyra from the typical preteen concerns and angst about which she empathizes with her audience. Kyra has her courses at the Academy, her best friends and her crush to worry about, and then there

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is that tell-tale colored streak in her hair that foretells her passion for the arts to even the most casual observer.

Table 7.1 features a sample record of Kyra's interactions - where a human visitor types in comments and the character reacts accordingly - to highlight each of the ten characteristics mentioned earlier, grouping qualities that are often expressed or presented simultaneously. We provide a textual description of Kyra's verbal responses, which appear in a text bubble above the character, and graphical actions.

Table 7.1: The Ten Key Perceived Qualities of Characters Expressed in Kyra, the Extempo Art Learning Guide

<i>Quality</i>	<i>Description</i>	<i>Expressed in Kyra through...</i>
Identity	Who is Kyra?	Kyra is a trendy girl of about twelve, whose first statement to the visitors is: "Greetings Mortal! I am Kyra, Chief Defender of the Arts!"
Backstory	What shaped who Kyra is?	"Professor Yamamoto, alias Captain Y, found me on his doorstep as a baby and taught me all about defending creativity from ignorance's dark side!" Kyra's adoption by Captain Y and educational emphasis on artistic understanding drives her passion for the arts.
Appearance	How does Kyra's embodiment limit, expand, and communicate who she is?	Kyra is presented as an anime rendition of a trendy young teenager, with expressive eyes, a streak of painted hair, wearing a futuristic outfit.
Content of Speech	What does Kyra want to talk about, what does she avoid, and how does she say things?	Kyra enjoys discussing her present her friends, magic powers, favorite pastimes, and her job, often using trendy, teenage words such as "like," "as if," and "whatever."
Manner of Speaking and Manner of Gesturing	How does Kyra express herself verbally and non-verbally?	Kyra often teases and interrupts the interactor, accompanies some utterances with shrugs, winks, and even martial arts movements.
Emotional Dynamics	What angers or excites Kyra, how does she express it, and how long does this emotional charge last?	Kyra thoroughly resents derogatory comments about her intelligence, is embarrassed by any references to her secret crush at the Academy, and deeply saddened by the passing of Professor Yamamoto.
Social	How does Kyra address and	Kyra is a young teenager intent on educating those

Interactions Patterns	react to those with whom she interacts? Does it change depending on gender, age, position, knowledge, or time she has known the interactor?	who interact with her on the importance of art and the accomplishments of many artists. She addresses interactors as peers and chooses what to expound on based on her interactor's knowledge of the topic.
Role	What value does she add to the web-site? What is her "job"?	Kyra is employed at the Extempo site to be a learning guide introducing young teenagers to art history and appreciation. Currently, her most popular lesson is the life and times of Vincent Van Gogh. Her role affects every aspect of her performance as she constantly directs visitors to topics, activities, and web-pages related to it.
Role Dynamics	How does she relate to human interactors in accordance with her role?	Kyra is a tutor. How she reacts to users' errors and triumphs is dependent not only of her moods at the time, but also on her personality and cultural-specificity.

MOTIVATION.

As some researchers in the field have recognized (see Perlin and Goldberg, 1996) an artistic emphasis in character design may be preferable to the psychological or biologically driven models of recognizable human behavior. Laurel (1991) observed that “we take pleasure when – and only when – even the surprises in the character’s behavior are casually related to its traits,” (p. 145) and the complexity in character that would result from an accurate model of human personality makes this enjoyable predictability harder to deploy in the formulation of the character’s actions. Laurel therefore suggested that “somewhat ironically, dramatic characters are better suited to the roles of agents than full blown simulated personalities” (p. 145).

Biologically correct behavior may not only detract from our enjoyment, but additionally, as Hayes-Roth and Doyle (1998) remark, biologically correct behavior

may be subtle and difficult for observers to interpret, and appear stilted and robotic when implemented through the present limitations of graphical animations.

Psychological modeling may believably render individuals with significant deviations accurately, but generating everyday humans may require extensive interaction sessions to capture the uniqueness of each individual. In contrast, perhaps due to what Bates (1994) described as the cumulative experience of producing hundreds of thousands of individual, hand-drawn, flat-shaded line drawings, moved frame by frame, "forced animators to use extremely simple, nonrealistic imagery, and to seek and abstract a precisely that which was crucial...to express the essence of humanity in their constructions," (p. 122).

In the English language, the verb *to believe* has historically been linked to a person, object, or statements' credibility and trustworthiness, often associated with religious dogmas. Within the entertainment industry, enterprises associated with the production of fiction have gradually and etymologically disassociated *believability* from trustworthiness and linked it directly with the audience's engagement in the novel, story, film, or performance. This engagement is most often defined as empathy with the characters' emotions and predicaments, through the suspension of awareness of the narrative's created- or artificial – nature. The perception that believability is the result of a willing suspension of disbelief originates from British poet and literary critic Samuel T. Coleridge's (1772-1834) autobiography, *Biographia Literaria*. Since

then entire books have been written advising aspiring writers and filmmakers on how to achieve this suspension of disbelief - from character emotions to camera angles. Quickly adopted into the gaming industry by the 1995 Electronic Entertainment Exposition in Los Angeles, during which Sega CEO Tom Kalinske echoed the rallying cry of the entertainment industry for the next decade: "Consumers will demand immersive experiences that create suspension of disbelief." Sony spokespeople, not to be outdone, claimed that their new Playstation "no longer requires the video gamer to suspend disbelief."

Achieving believability continues to be the holy grail of character design, whether expressed through animation, acting, filmmaking, writing, or programming, and deservedly so. Widespread audience engagement leads not only to repeat visits and word-of-mouth recommendations, but also to commercial opportunities (as the Disney empire has demonstrated), brand loyalty, and even other less pecuniary returns. As Reeves (2001) reported, quantitative studies have shown that merely placing a character with natural language processing next to a form's text entry box increases dramatically the number of search words per query (from approximately 3.3 words when a character is not present next to the text-box to 8.5 words when a character appears next to the text box) and simultaneously increases the grammatical correctness of the statements. These invaluable aids to the search engine mechanisms were accompanied by appealing results for web-based commerce. The 15,000 visitors

who interacted with a customer service representative character were three times more likely to reveal personal information than the 75,000 visitors to the dell.com web site who did not interact with the character. The visitors who interacted with a character were twice as likely to add items to the shopping cart and accepted twice as many suggestions or recommendations from the character. Moreover, visitors interacting with the character represented a 25% to 35% increase in the rate of success of up-selling merchandise and service agreements.

Reeves' findings arise from his analysis of Finali Corporation's characters on the dell.com web site, characters supported by finite-state machines as dialog models, such that visitors would choose from a small set of options to converse with the character. Extempo's characters have natural language conversational abilities, and accordingly complex personalities and moods, to appropriately handle most of the visitors' freeform utterances. Unlike Reeves' Finali characters, often deployed in single-visit trouble shooting or purchasing pages, Extempo's characters tend to be deployed in sites where repeat visits are desirable with or without explicit commercial goals. A typical example of Extempo's characters is Mr. Clean, which Extempo designed for Procter and Gamble's forty-year-old brand icon and who generated 80% repeat visits from customers seeking "his" advice on cleaning challenges.

Perhaps a more telling example is found in another Extempo character, Jack, the a furry cream-colored wheaten terrier puppy who could converse with visitors

through his free-form text entry box and text-to-speech engine at the unfortunately demised Petopia.com, a company specializing in home delivery of pet supplies. Jack's antics and barks persuaded approximately 75% of the site's visitors to reveal personal profile information. From e-mail addresses to hometown and gender, to information about their pets and hobbies, names, web experience, and experience with the company, visitors happily divulged personal details of their everyday life. Interacting with Jack led to a typical (90% of visitors) stay of twelve minutes, with each visitor typing in approximately fifteen sentences to Jack on topics as varied as discussing their own pets, Jack's haiku and gossip stories of Jack's animal friends, as well as Petopia's philanthropic "Bottomless Bowl Service" program and the "Million Pet Mercy Mission," and watching Jack perform animated tricks onscreen.

Figure xx: Petopia's Jack, a wheaten terrier puppy



During the first four weeks of 2000, approximately 30% of the 1,000 unique visitors who interacted with the delightful Jack returned to interact with him within

two weeks (often several times), and more than 60% accepted Jack's suggestions to visit specific target pages – from Petopia's philanthropy pages to more tailored content on products for the users' pets – compared with the 1% of visitors who clicked through to the philanthropy pages spontaneously. Jack has such a following that Extempo is hosting him at their own site, now that Jack's previous cyber home has disappeared. You can interact with him by following the "R&D" link from the "Demos" page at Extempo's website (www.extempo.com), and choosing the "Arena" link off the left navigation bar.

Despite the difference in interaction abilities, domain of deployment, character complexity, and goals, Reeves' Finali findings match those of Extempo and substantiate our claim that interacting with computer characters triggers certain behavior patterns in visitors. These patterns - such as the shift from transaction to conversation Reeves reported in his text-box example – signal an interaction that does not consider the created or artificial nature of the character. Rather than pausing and considering whether the computer character next to the text box is an entity, we interact in a primarily social context as if with another sentient being.

If - as the findings and research we have outlined thus far suggest - what is primal of our interactions with the world is our suspension of disbelief, rather than an awareness of the created nature of the objects we interact with in our daily activities, if this suspension of disbelief predates the stimulus and if, moreover, our primary

mode of interaction with the world is to ascribe human like emotions to inanimate and barely animated objects, different research dimensions and design considerations become salient. Far from aiming at designing interactions with created media to elicit a willful *suspension of disbelief*, we should aim to design interactions where the deferment of questioning fails and *suspension of belief* is triggered. Moreover, we should consider that what may be willful and requires considerable cognitive effort is this *suspension of belief*. Rather than enumerating different possibilities for creating believable characters and experiences that create suspension of disbelief, if this suspension of disbelief is so primal and basic a human instinct, future believability studies should consider addressing the breakdowns that cause audiences to perceive the created nature of the characters and experiences.

Therefore we ground our exploration of the dimensions of character design on identifying situations where the *suspension of belief* may be disrupted, and join character animators in their quest for believability, rather than focusing on replicating or simulating realistic behavior. “That is what we were striving for...belief in the life of characters” (Jones, 1990, p. 13). Although there are identifiable advantages to mimicking and matching users' central psychological tendencies, in particular within the realm of persuasion (Nass and Reeves, 1996), we believe that for a character to be engaging and believable he or she need not match our personality. However, even though believability is not dependent on accurate realistic simulations, it is highly

dependent on the viewers' ascription of emotion to the created characters, as these emotions are key to revealing how and when the characters “appear to think and make decisions and act of their own volition. It is what creates the illusion of life” (Thomas and Johnston, 1981, p. 9).

Although adept storytelling and narrative construction also play prominent roles in engaging the audience, as Flannery O’Connor observed, “it is the characters who make the story, and not the other way around.” Believable characters drive every engaging story, yet the types of characters needed for an engaging story may occasionally have to be, of necessity, characters whom we may not wish to emulate, nor those who resemble us, just as engaging individuals we encounter every day need not match our personality or lead exemplary lives. Many of the greatest characters of literature have intentionally been crafted as scoundrels, including O’Connor’s. Thomas and Johnston (1993), legendary Disney animators, even claimed that without their villains the beloved Disney heroes would lose their appeal, because only a worthy nemesis forces a hero to rise in defense of what is right.

Even if we would prefer not to lead the life of Hamlet, Don Quixote, David Copperfield, Snow White’s Queen, or Scarlett O’Hara, and would not make the same choices as Wile E. Coyote and Donald Duck, we nonetheless appreciate their ingenuity and endurance, enjoy their triumphs, and share their sorrows. Far from limiting the appeal of villains to static media, the success of recent interactive games

– such as Rockstar Games’ Grand Theft Auto and Electronic Arts’ Dungeon Keeper – have shown that temporarily embodying evil roles can be as enthralling and enjoyable an experience for the audience as interacting in a fantasy world through a heroic character.

Therefore, rather than looking for a central tendency among all people and our characters, we seek instead a metaphorical match similar to that of characters in narratives, film, and television, giving our characters interesting variations, similar to the interesting variations we see among people, as this is an essential element of human - and characters' - appeal. Chuck Jones, creator of many beloved Warner Brothers’ cartoon characters, recommended to budding animators that "it is the individual, the oddity, the peculiarity that counts...eschew the ordinary, disdain the commonplace. If you have a single-minded need for something, let it be the unusual, the esoteric, the bizarre, the unexpected, such as a cat hooked on grapefruit."(Jones, 1990, p.14, 20)

Interesting sources of variation need not just be individual, but may also be cultural despite the relative research preference in character design for exploring individual personality variations. The role of cultural sameness of interactors has been proved to be as important as psychological matching, particularly in terms of persuasion. In particular, the studies of Osbeck, Moghaddam, and Perreault (1997)

across multiple cultures suggest that individuals and groups are more inclined to like those characters that they perceive as culturally similar to themselves.

Recent research by Nass et al. (2000) also shows that characters from the same ethnic background as the interactor are perceived to be more socially attractive and trustworthy than those from different backgrounds. Moreover, participants in these experiments, also conformed more to the decisions of the ethnically matched characters and perceived the characters' arguments to be better than those of the ethnically divergent agents. Therefore, cultural localization is critical even for researchers and designers who craft their characters to actively match the user's ethnicity, and perhaps also central psychological tendency. Untapped roles for which characters of certain cultural backgrounds are desirable, independent of the cultural background of the interactor, are also plentiful even outside the realm of persuasion: teaching culturally specific subject matter - from language practice to cooking - castings for entertainment and narrative roles, among others.

Localization of characters must go beyond the obvious language translation. Just as adapting interfaces to different countries requires not only changing the language, but redesigning the interface's appearance, content, and interactive behaviors that could be considered inappropriate for that country (Miller, Koza, Davis, 2001), adapting a character to a different culture involves careful reconsideration of each of the ten key characteristics identified earlier. These

characteristics - *identity, backstory, appearance, content of speech, manner of speaking, manner of gesturing, emotional dynamics, social interaction patterns, role and role dynamics* - both define and are defined by each character's unique idiosyncratic behaviors and signature personality traits, as well as by the character's cultural grounding. Even as each human personality is unique, each culture tends to evoke specific modes of adjustment and reactions in different situations (Ewen, 1988).

These cultural variations among people are responsible for the considerable diversity of specific cultural norms even among populations located geographically near and for many embarrassing moments in multicultural exchanges. They give us cultural stereotypes that allow members of particular cultures to recognize each other and ascribe cultural backgrounds to individuals they encounter in everyday life. Cultural stereotypes need not be limiting, pejorative, negative definitions. Stereotypes can be positive constructs -- ways of describing patterns of diversity in human behavior that make our interactions with human beings rich, interesting, and delightful -- without offending the represented culture. The ideal balance, where both the represented culture recognizes itself in the character and, simultaneously, members of other cultures also ascribe the desired background to the same character, without offending either group of potential users, hinges on extensive user testing of

culturally- or group- specific characters with user populations of both the represented culture and other cultures.

A MULTICULTURAL PERSPECTIVE OF THE TEN KEY QUALITIES OF ANIMATE CHARACTERS.

We find culturally specific tendencies in each of the ten key qualities of animate characters mentioned earlier, and to illustrate how these qualities can be instantiated toward providing a blueprint for the design of culturally specific characters, we have built three culturally specific instances of the character Kyra. American Kyra shares with Brazilian Kira and Venezuelan Kirita the same identity, embodiment, and teaching role, yet differs in the remaining seven key qualities of animate characters we enumerated: backstory, content of speech, manner of speaking, manner of gesturing, emotional dynamics, pattern of social interaction, and role relationships.

By maintaining the embodiment, identity, and teaching role constant, we aimed to highlight the significant degree of cultural specification possible within the typical project constraints and deadlines. That is, given an existing successful character, how can the key qualities we identify guide the localization of the character to other cultures? Ideally, the cultural specificity and focus of a character pervades

every aspect of the character's development, yet consistency of character and role across the various cultures she or he operates in is critical for the purpose or branding of the character's sponsors. Moreover, often the underlying engine and animations prove too expensive and time-consuming to localize for every culture in which the animate character will operate.

Let us now describe and highlight how each of the qualities enumerated earlier and exemplified in Kyra are particularly salient within the framework of cultural specificity.

Ten Key Qualities of Animate Characters

- Identity
- Backstory
- Appearance
- Content of speech
- Manner of speaking
- Manner of gesturing
- Emotional dynamics
- Social interaction patterns
- Role
- Role dynamics

I.- Identity:

Who is the character? *Identity* as a category encompasses not only the character choice in terms of demographics and description, but also the personality traits and qualities of the character, including what she or he likes and dislikes, and the character's signature and idiosyncratic behaviors. As successful implementations of text-based characters demonstrate, from Weizembaum's (1966) Eliza to the more recent Julia study by L. Foner's (1993), a character's *identity* is a distinct category from their *appearance*. Disembodied text characters amply convey a sense of

personality and identity to the extent that participants often shared personal information - even private details- with both agents mentioned, and even asked the popular chatterbot Julia to go on off-line dates without realizing her digital nature. An animate character's appearance merely represents graphically certain physiological aspects - such as race, size, build, hair color and style, weight, age, and gender - and certain elements of the character's personal history and temperament – such as socioeconomic background and style. Theories of self abound, ascribing aspects of identity to genetic profile, personal history, and experience, even religiously determined. Yet the aim of this chapter is not to settle such a debate or to specify the artistic and theatrical requirements for engaging personalities, but rather to highlight the percolation of cultural norms and roles as they impact the character's identity in every facet of the interaction. For example, by choosing a child as a character, cultural conventions dictate the appropriateness and form of the character's activities expressed in the manner of addressing visitors of varying ages.

By choosing a female character to specialize culturally, in Kyra, we are tackling this challenge head on as the social roles of women vary across cultures with a greater spectrum and nuance than those of men. In some cultures, women have been excluded from explicit participation in the business world until recently, and in some fundamentalist societies, women are explicitly forbidden from interacting with members of the opposite sex outside the family unit. The most banal conversational

exchange - such as appropriate responses to flirtation and banter between the genders – has the potential for breaking the engagement of the visitor. Even in the so-called developed countries, people still assign certain professions and roles to particular genders and, on average, express less confidence in a voice-over statement when the stereotypical gender assignment is reversed (Nass, et al, 1997).

II.- Backstory:

We use the term *backstory* to refer not only to cultural variations in individual reactions, but to any self-recognized individual experience and history that had a direct influence on the character's personality, as well as current facts of the character's "life" outside the screen. We can draw a parallel between the aspects that we group under a character's backstory and what a person would write in his or her diary or memoirs, as opposed to unrecognized and unconscious personality traits and quirks, which are classified under the *identity* category. Thus, a character's backstory encompasses family relations, friendships, favorite sports and colors, important celebrations, love interests, financial status, and political and religious affiliations, yet excludes the fact that the character unconsciously rubs his or her nose when embarrassed and tends to pedantically interrupt interactors, among other personality traits. Even as each human personality is unique, each culture tends to evoke specific modes of adjustment and reactions in different situations (Ewen, 1988). Therefore,

every character inevitably highlights some cultural grounding from his or her backstory in their commonplace interactions.

When enumerating the ten key qualities of animate characters, we alluded to their intertwined nature, as in a well-crafted character every one of the eight remaining characteristics should convey aspects of the animate character's identity and backstory. Let us continue using our case study of Kyra's localization to three different cultures to illustrate the possibilities available to character designers in these eight remaining qualities: appearance, content of speech, manner of speaking, manner of gesturing, emotional dynamics, social interaction patterns, role, and role dynamics.

III.- Appearance:

Appearance refers to the encoding of each characters' identifying physiological form such as race, size, build, hair color and style, weight, age, gender, and certain elements of the character's personal history and temperament, such as socioeconomic background and style, in the chosen embodiment of the character, as well as the representation of this embodiment.

Appearance affects the character's effectiveness and credibility at performing their assigned role and directs the patterns of interaction. Characters without graphical representations still have an appearance encoded by the word choices of their descriptions - for example, one can describe a character with the same identity as fat,

chubby, round, pot-bellied, overweight, and even robust, with each word alluding to a different interpretation and cultural implication.

Before the character utters a single word, before the web-page is completely loaded, the visitor has already processed the subliminal cues embedded in the characters' representation, such as the relative status and occupation of the interactors, and formed a model of what pattern the ensuing interaction will follow. Even a subtle distinction as status relations between peer-to-peer and superior-to-underling can be deduced from the social norms and cultural cues the character's appearance presents.

Figure 7.2: Kyra²



Character designers must take care to understand the gender roles, traditional attires, and cultural norms that impact every user's experience differently just by

looking at - or reading a description of - the character. It is critical to choose a representation of the character that will appeal to the targeted population and an attire that will also be considered acceptable - or at least neutral - for the target population and role. For example, an American web-guide at an online wedding registry would probably wear a white dress, whereas in a site aimed at Chinese brides, the character would wear red clothing and avoid white, as white is considered a color of mourning in Chinese culture. Similarly, an edgy punk cartoon-rendered character may not be the best match for a role mediating executive conference calls.

The first design recommendation we can offer for a character's appearance is to design the character as attractive as possible for the target audience. In his famous book *Influence: The Psychology of Persuasion*, Cialdini (1993) explored the often untapped potential that physical attractiveness offers in social relations. Summarizing psychology research studies Cialdini showed how physical attractiveness often triggers a "halo effect," where one positive characteristic of a person dominates the way the person is perceived by others.

Cialdini evaluates how attractive people are seen as possessing better personality traits and intellectual capacities from early on; good-looking elementary school children are presumed to be more intelligent than their less attractive

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classmates by teachers, and their aggressive acts are perceived as less naughty. Attractive political candidates in Canadian elections received more than two and a half times as many votes as unattractive candidates. Attractive candidates for a private job offering were chosen over those with better qualifications; handsome men receive lighter penal sentences and reduced monetary penalties and are even twice as likely to avoid jail as unattractive defendants. Furthermore, attractive people are more likely to obtain help when in need, from members of either gender, and are more persuasive in changing the opinions of an audience even when the participants “denied in the strongest possible terms that their votes had been influenced by physical appearance” (Cialdini, 1993, p. 171).

Certain features and proportions believed to be universally appealing as evolution mechanisms and reproduction strategies include estrogenized female faces with small chins, androgenized male faces with large chins and cheek bones, and female bodies with optimal waist-to-hip ratios around 0.7. However, as the American adage states, “beauty is in the eye of the beholder,” and we should keep in mind that attractive features and fashions are not only culturally-specific, but also period-specific. Standards of beauty are constantly changing, from Rubenesque curves to the rail-thin look sported by models Twiggy or Kate Moss; some symbols of status in African and Eastern culture may seem to the average Westerner as differing from the

expected norm, as the prevalence, acceptability, range, and rate of hair color change in certain cultures to individuals from other cultures.

For example, in choosing to maintain Kyra's appearance constant, we provoked stronger than anticipated reactions in our Brazilian testers because of the incongruity of her colored hair within their daily experiences and culture. This cultural response may be attributed to the greater homogeneity in appearance and behaviors of collectivist culture, which we discuss in greater detail later, and to the relative lack of exposure of the Japanese animation tradition of manga and anime in Brazil, which American Kyra was designed to emulate. Although not many Japanese animes may have been translated to Portuguese, American Kyra reflects this style and tradition to the extent that the character has been known to spout haiku poetry on occasion.

Gard, in a recent article for Game Developer magazine, added consistent costume and attitude poses to physical attractiveness in his recommendations for game character designers. He suggested exaggerating particular elements of the characters' personality to symbolize the essence of the character through simple clothing articles or patterns that make the character easier to remember and recognize, such as Hermes' winged feet and Spiderman's black on red web pattern. Gard suggests minimizing complexity of the costume and a limited palette of colors while increasing the dynamism of the character's trademark poses. We discuss identifiable

poses and gestures in greater detail under the *Manner of gesturing* category, yet the importance of costume to convey cultural specificity may occlude a general character design guideline that Gard barely indicated. Accoutrements and accessories of the character tend to convey significant non-verbal information about the character's *role* and *role dynamics*, yet these objects are imbued with varying cultural meaning. When designing a character, it is suggested that the gestures, clothing, and accessories extend the character's *role*, *role dynamics*, and *backstory* in such a way as to aid the visitor's understanding and identification of these facets of the character. To borrow an example from the movie industry where accessories convey the difference in role dynamics, Professor Henry Jones Sr. (Indiana Jones' father) and Lara Croft share the role of intrepid archaeologists embroiled in shady, dangerous research, in their signature films, yet the glasses and twill jacket of Professor Jones are a far contrast to the guns and tight, revealing clothing Lara wears.

Based on this research, the design recommendation we can offer is to choose representations whose appearance provokes no strong negative reactions in any culture, whenever the expectation of cultural localization arises, rather than representations that inspire positive reactions only in some cultures, but simultaneously inspire strong negative reactions in other cultures. Nonetheless, we must temper that recommendation with the warning that choosing too bland and adaptive a character might detract from the character's appeal in any culture. As the

Microsoft paperclip character illustrates, designing a character within the zone of indifference of several cultures will not lead to its success as a localized character for any of those cultures (Reeves, 2001) unless other key aspects of his - or her - persona are localized to each culture.

IV.- Content of speech:

When considering how an agent should change between countries, language is the first porting issue that comes to mind, yet the available topic choices for the character may present even more salient cultural cues.

We analyze some of these topic knowledge requirements in detail shortly, but first let us address the importance of matching the language and dialect of the character with the culture it represents as closely as possible. Our Brazilian Kira's dialog was authored to reflect her Brazilian roots and upbringing, quite distinct from the continental Portuguese variations. (The difference between these two forms of Portuguese is so noticeable to fluent speakers that it is common for Portugal-born travelers in the interior of Brazil to be mistakenly identified as Italian.) Beyond spoken and written language, our characters should speak in a way that the intended audience understands, which encompasses idiomatic expressions, slang, and colloquialisms, as well as sensitively tailoring word choices to the semantic shades of meanings particular to each cultural group. Although they both speak English, an American character would utter sentences whose syntactic content would be very

different than a British or Australian agent, even if the semantic content remains the same. For example, the French slang word "gosse" would mean "kids" to a Frenchman, but a very private male body part to someone from Quebec!

By concentrating on the syntactic content of the character's utterances, character designers run the risk of overlooking the cultural diversity present in the semantic content. Alluding to certain culturally diverse topics can enhance the character's perception as a representative of specific cultures - local historical incidents, geographical details known only to locals, sports, favorite pastimes, recent local events, holidays, and humor, among others (Axtell, 1985). Recent research has shown that certain topics previously considered as anathema to cross-cultural conversations – particularly money, politics, and religion – may have certain positive influences when raised by a helper agent. Isbister, Nakanishi, Ishida, and Nass (2000; see also chapt. 11) studied the effects of a helper agent represented as a blue dog, which suggested either safe or unsafe topics at awkward pauses in the conversation between one Japanese and one American partner. In this study, American participants rated the interactions mediated by an agent who suggested unsafe topics more interesting, and Japanese found it more comfortable and engaging to continue than the interaction mediated by an agent who suggested safer conversational topics. Moreover, the agent's topic suggestions affected each participant's perception of self and of the other participant in the conversation, as well as the agent in surprising

ways, underscoring the need for further research in cross cultural communication. For example, Japanese participants rated the agent who suggested unsafe topics as nicer and more competent than the agent who suggested safe topics of conversation, whereas American participants found the agent who suggested unsafe topics more blunt and domineering, less restrained, less friendly, and, not surprisingly, less appropriate than the agent who suggested safe topics of conversation.

The treatment of certain sensitive topics traditionally associated with high emotional content – topics dealing with embarrassing or dishonorable situations (e.g., losing your job), rites of passage (such as birth and death) – often vary across cultures. Each of our Kyra triplets is quite different from one another in terms of their respective cultural topic knowledge. For example, American Kyra composes her own haikus, loves Jackson Pollock's art and eats mint chocolate chip gelato. Venezuelan Kirita enjoys dancing Merengue, the art of Venezuelan kinetic sculptor Carlos Cruz Diez, and loves the traditional corn-flour arepa sandwich. Brazilian Kira prefers the martial arts-inspired *capoeira* dance to soccer, although she shares her countrymates' pride in legendary soccer star Pele, and admires the art of Aleijadinho, a famous Brazilian Baroque artist from the 18th century.

A telling example of ways in which culture affects the characters' presentation and identity lies in how each of the Kyras approaches the issue of the character's abandonment and adoption as a toddler, which we maintained constant across the

three implementations as a key feature of her backstory. For American Kyra, the issue is significantly less shameful than discussing her present crush. If asked about her family, American Kyra openly explains, "I'm an orphan, and no, I don't mind being one. There's an interesting story behind that. Would you like to hear it?" Meanwhile, Venezuelan Kirita hopefully explains, "Soy huérfana, pero no pierdo la esperanza de encontrar a mis padres algún día. Mi única familia es el Profesor Yamamoto, quien me crió." ("I am an orphan, but I haven't lost the hope of finding my parents one day. My only family has been Professor Yamamoto, who raised me.") In contrast, Brazilian Kira sadly categorizes her state: "Eu sou orfa. Nao eh bom ser orfa. Eu nao sei se meus pais verdadeiros estao vivos ou mortos." ("I am an orphan. It is not good to be an orphan. I don't know if my real parents are alive or dead.")

The phrasing of the character's utterances - beyond the use of colloquial expressions and culturally specific word choices - may also play an important role in establishing each character as a genuine representative of the culture they portray. Markus and Kitayama (1991), suggested that Americans may value autonomy and internal consistency with past actions, as well as personal expressions of uniqueness from others and from the environment. However, the researchers suggest that these cultural traits may not be present, or at least may be present to a much smaller degree in other cultures, in particular Asian cultures.

Individuals from individualistic cultures emphasize interpreting and explaining reasons for feeling, thinking, and acting in terms of attributes perceived to be internal to oneself and independent of external social forces. In contrast, in collectivist cultures, the individual's thoughts, feelings, and behaviors are organized, experienced, and explained in terms of social relationships, roles, and responsibilities (Miller, Koza, Davis, 2001). Characters can - and often do - conform to such norms of behavior. The earlier anecdote of Brazilian Kira's hair controversy illustrates the Brazilian rejection of emphasizing individuality and the greater degree of collectivism in the Latin American cultures. These observations lead us to advise designers of culturally specific characters to avoid questions and statements implying personal agency when localizing characters to collectivist cultures in favor of those utterances emphasizing relationships.

V.- Manner of Speech:

Not only is what is said important - the topics addressed - but also how and when it is said. The acoustic characteristics of speech, intonation, pronunciation, timbre, and range of vocal expressions, with the appropriate variation for the localization of the character, are constantly used in everyday activities to differentiate individuals from cultures where other cues do not convey the necessary degree of specificity. These conversational aids can be used to determine not only the geographical origin of a particular person or character, but even their cultural

influences and places of residences, as phonetic expert Henry Higgins in George Bernard Shaw's play, *Pygmalion*, illustrates.

Even without the additional communicative channel that text-to-speech engines provide, there are several other characteristics of speech that transmit the essence of each individual character and their cultural specificity, such as timing, speed, and the frequency with which the character uses slang words; sentence length, choice of complex or simple words, frequency and choice usage of conversational crutches (such as "hmm," "uhm," and "like"), and stuttering. For example, a teenager may transmit the same semantic content than an adult with the same cultural background using similar culture-specific words and references, yet pepper the syntactic content of their speech with trendy age-appropriate words and conversational crutches.

For comparison purposes, in Table 7.2 we feature an exchange where each of the Kyras has waited for their human partner to answer their question for a full minute. Before continuing to wait, each Kyra reminds the interactor in her own individual voice not only of whose turn it is in the conversation, but also of how to interact with the character in case the interactor is confused as to how to communicate with her. As the interactor's inactivity period lengthens, the bored character decides to use the opportunity to recharge her energy, which decays during the interaction, and after warning the interactor accordingly, Kyra, Kira, and Kirita proceed to fall asleep.

We should note that the inactivity period that enacts the sleep response varies in its duration for each of the three Kyras, although in the following transcript it has been edited to compare the utterances and actions of each character. When the interactor finally reacts to the sleeping character, she awakens and yawns with a characteristic utterance for each of their personalities.

Table 7.2: Manner of Speaking:
Kyra, Kirita and Kira' React to Inactivity

American Kyra	Venezuelan Kirita	Brazilian Kira
"I hope you haven't forgotten about me, superstar! Type something into my text box to get the ball rolling again."	"Espero que no me dejes aquí plantada esperando mucho tiempo. Escribeme algo en la caja de texto de aquí al lado en cuanto puedas." ("I hope you don't leave me standing here too long. Write me something in the textbox next to me as soon as you can.")	"Nao se preocupe, leve o tempo que precisar. Quando quiser digite a sua resposta na minha caixa de texto." ("Don't worry, take the time you need. When you want to, type your answer in my text box.")
Interactor remains inactive.	Interactor remains inactive.	Interactor remains inactive.
> The character yawns.	> Kirita bosteza.	> O personagem se expreguica.
Interactor remains inactive.	Interactor remains inactive.	Interactor remains inactive.

"I'm going to get some inspirational thinking done while you do what you need to do, mortal. Just start typing when you want me again."	"Bueno, ya que tú tienes otras cosas que hacer, yo me voy a echar la siesta. Despiertame cuando quieras seguir hablando, tipeando en la caja de texto de aquí al lado." ("Well, as you have other things to do, I will take a nap. Wake me when you want to continue our conversation by typing in the text box next to me.")	"Vou tirar uma soneca para refrescar a cuca. Quando quiser falar comigo novamente, basta começar a digitar na minha caixa de texto. " ("I'm going to take a nap to refresh my head. When you want to speak with me again, just start typing in my text box.")
Interactor remains inactive.	Interactor remains inactive.	Interactor remains inactive.
> The character goes to sleep.	> Kirita se queda dormida	> O personagem vai dormir.
Interactor types "Hey!"	Interactor types "Epa!"	Interactor types "Oeh!"
"Well, that's enough of that!"	"Gracias por despertarme - ya me sentía como la Bella Durmiente!" ("Thanks for waking me up- I was beginning to feel like Sleeping Beauty!")	"Vamos voltar a nossa atividade!" ("Let's get back to what we were doing!")

Before we move onto nonlinguistic expressions of culturally specific animate characters, it is worthwhile to mention that particular care should be taken with greeting the interactor. The interactor's first impression of the character affect every exchange between them, and care should be taken to design this initial greeting according to the desired role and role dynamics. Greeting the visitors on their return visits as such is also key to preserve the characters' believability, particularly if the character is graphically represented with a face, and the programming ease of browser

cookies has lowered the overhead of adding this social requirement. Although we may forgive memory lapses on conversations and discussion topics for both people and characters, the character's facial features give rise to the expectation that the character can somehow "see," recognize, and address visitors she or he has previously met accordingly.

These suitable greeting patterns include addressing the interactor appropriately from the first moment on: title usage and familiarity are key cultural constructs that designers of culturally specific characters must master. Some cultures prefer a first-name basis even in the most formal occasions (such is the case in Thailand and Iceland) whereas others reject addressing someone by their first name unless several years of close communication have elapsed. Although Americans are notorious for avoiding most titles, many Latin American countries use "doctor" as a prefix for anyone that has completed undergraduate studies or has a position of authority. Special care should be taken not to generalize across geographical boundaries, because, for example, within the same business context, Antonio Martinez Campos would respond to "Señor Martinez" in Venezuela and Bolivia, but "Sr. Campos" in neighboring Brazil, "Mr. Martinez" in Britain, and would be addressed as "Tony" in the United States.

VI.- Manner of Gesturing:

Gestures are an integral transmitter of meaning in our everyday dialog; when deprived of them as semantic aids, we recur to auxiliary mechanisms such as describing emotions, actions, and reactions, or using typographical aids to transmit this information, as the proliferation of emoticons (emotional icons) in e-mail and text-messaging demonstrate. Cassell and Stone (1999) suggested that we use our faces and hands as an integral part of our dialogue with others no matter what our language, cultural background, or age may be, but identified particular emblematic gestures that appear to constitute between 10% and 20% of the everyday gestures produced by speakers engaged in conversation as culturally defined and imbued with meaning. Certain cultures have been shown to exhibit a greater number of these emblematic gestures in their communicative repertoire - such as French and Italian - than others, with Italian speakers often substituting emblematic gestures for speech. Moreover, members of certain cultures exhibit a greater quantity of gestures per utterance than others, with British nationals often qualifying for the least number of gestures used in conversations. Cassell (2000) also recognized cultural variability among those gestures intended to represent a common metaphor. In particular, conduit metaphoric gestures, which depict abstract ideas as bounded containers that can be held and passed between conversation partners, have been shown to vary

dramatically across cultures and are even absent in certain language communities' narrations such as Chinese and Swahili.

Although some gestures only acquire meaning within certain community-based conventions, identical gestures often have quite different semantic content among different societies. In particular, assent and dissent gestures should be carefully monitored. For example, what Americans understand as the symbols for "ok," with the thumb and forefinger forming a circle and the remaining fingers extended, is insulting for a wide range of cultures including Brazilians, Russians, and Germans. The same gesture is commonly used both to refer to money in Japan – alluding to a coin's shape – and to worthless items – zero shape – in France. Similarly, even the simplest head nod can be interpreted as formal assent, as a sign of attentive listening, as a turn-taking confirmation, and as a formal negative, depending on the cultural context in which it is used.

Although gestures are integral to and support spoken dialog, they are also imbued with culturally specific meaning when decoupled from the active speech acts. Feyereisen and De Lannoy (1991) argued for a culturally specific "technique of the body," believing that as each person learns the dialect and language of the group to which she or he belongs, she or he reproduces the gestures, face movements and corporal expression typical of that group. From the directness and length of eye contact, to gestures and postures asynchronous with speech, all are embedded with

cultural cues and conventions. For example, Japanese and Koreans often interpret a direct, sustained gaze as insulting or even as an overtly sexual gesture, whereas in the United States averting the gaze is often interpreted as dishonest behavior, a weakness, or an expression of extreme shyness at best. Similarly, while addressing visitors from a standing position may express respect in certain settings, in other cultural contexts it can express undesirability toward the interactor, just as welcoming visitors from a sitting position can be negatively interpreted as a status sign.

VII.- Emotional Dynamics:

Animate characters' emotional model should impact their behavior and in turn be affected by the interactor's comments and actions. A sentence with identical semantic and syntactic content is performed much differently - graphically or through a text-based description - depending on the character's emotional state at the time. Emotional dynamics affect what gets said, how it is said, and the reactions of the character in light of the interactor's utterances.

The appropriateness, frequency, degree of emotional outbursts (such as crying, yelling, seething), amount of stimuli required for the outburst to reach its performance threshold, and length of time an emotional state lasts, as well as the degree of comfort with direct confrontations, vary across cultures. However, beyond how they are expressed, whether all our emotions - barring the startle and innate affinity/disgust reactions - are socially constructed and learned or innate remains an

open research question with important implications for the field of multi-cultural character design.

Recent research by Picard (1998) holds the promise of monitoring the interactor's physiological emotional state unobtrusively in the near future, thus allowing the characters to adapt their roles and behaviors in response or in preparation to some universal interactor's moods. Yet knowing the interactor's emotional states still leaves the question of how to appropriately interpret and respond to these moods and emotions open for the character designers, because the character's response to the interactor's emotions are interpreted through the interactor's expectations of socially acceptable behavior. The muted emotional response of an Asian character may not be perceived as empathic by the Italian interactor; in fact, it may be completely misunderstood as indifference.

What dimensions of emotions each character should have, what emotional states should be specifically accounted for and populated with multiple behaviors within the emotional dimension coordinate space, as well as how these emotions should be represented and performed by the character depend largely on the emotional theoretical framework chosen by the character designer. As Brave and Nass (2002) summarized, evolutionary theorists argue for innate emotions evolved to address a specific environmental concern of our ancestors, whereas emotion theorists claim that the role of higher cortical processes in differentiating emotions points

toward emotions' constructed origins, such that any cross-culture consistency would be the result of similarities across social structures, rather than biologically grounded.

Between these extremes is the often called basic emotions theory, which draws on primate and cross-cultural studies to argue that emotions such as fear, anger, sadness, joy, disgust, and perhaps even surprise and interest are shared and recognized by all humans (see Ewen, 1988). Although they may be perceived to be of differential intensity, the basic emotions theory allows us to craft certain believable behaviors in our characters that may be recognized across the world within those six basic emotions, in contrast to the culture-specific dimension space that the emotion theorists claim, and to the absence of the need to consider emotional dimensions' variability across cultures that evolutionists claim.

As for our case study, all our Kyras share two main mood dimensions: an emotional one ranging from happy to sad, and a physiological dimension ranging from peppy to tired. The Venezuelan Kirita and the Brazilian Kira, however, in keeping with their Latin American temperament, have a social dimension ranging from friendly to shy, which allows them to respond to the interactor's flirtatious or insulting comments quite dramatically, and to populate the space suggested by the basic emotions theorists. The three Kyras differ drastically in the period of time until every mood regresses to a neutral state, with the Venezuelan Kirita maintaining every emotional charge the longest among the three, as well as the extent to which they

express these emotions, with the American Kyra showing the most dramatic displays of anger.

VIII.- Social Interaction Patterns:

Perhaps even more important than what is said, how it is pronounced, and how gestures support the utterance is the knowledge and timing (what colloquially is termed *tact*) of when and how to bring up certain topics, which varies dramatically across cultures. When to bring up business issues within an interaction -- even if it is constrained to providing information to a web visitor - as well as when to knowingly breach the familiarity barrier within a multiple-visit relationship, are examples of culturally variable time periods that characters must respect.

Disclosure tends to correlate with increasing familiarity, yet the timing of the request for information can bring an otherwise enjoyable conversation to a dead halt. For example, personal questions and information about family are always off limits for many Arab and Asian cultures, in particular those regarding the females within the family, yet they are commonplace and often expected even among casual acquaintances in American and Western cultures. The Extempo character Jennifer Jones, a female spokesperson for a fictional car company, often chats with her visitors about her husband and child and asks similar information from the visitors. This interaction exchange pattern is quite common among American women, her target

audience (for transcripts of Jennifer Jones' interactions, see Hayes-Roth and Doyle, 1998).

Our present technological limitations force us, as designers of interactive characters, to confront the reality that our characters may make mistakes more often than not, either understanding or responding adequately to their interactor's utterances. How the characters recuperate from these blunders, whether and how often they acknowledge a lack of understanding, and whether they apologize for it are highly dependent on each culture's perception of mistakes and appropriateness of continued apologies. Therefore, characters from individualistic cultures may believably use a defensive non-apologetic response, such as: "Hey, I don't know everything yet, do you?" when the interactor's utterance cannot be matched to the character's expression library. In contrast, characters from collectivist cultures, would tend to acknowledge the blame and apologize, perhaps even using contextual cues to shift the focus away from individualistic performance, as this has been suggested to lead to greater empathy within collective culture members (Miller, Kozu, and Davis, 2001). For example, in the situation where the interactor's utterance stumps the character's backend, a character from a collectivist culture could say: "Sorry - what was that? If it is not too much trouble, let's try that again."

Other important culturally variable social interaction patterns that character designers should explicitly address are how frequently the character should take the

initiative in the conversation, the appropriateness of interruptions, the pace of the turn-taking conversation, how the interactor's comments are acknowledged, and the frequency with which questions can be exchanged, among others. Our Kyras are particularly different in terms of the social interaction patterns they exhibit. American Kyra speaks with authority and urgency, turning every lesson into an exciting battle plan, and although she is quick to encourage, she is not afraid to reprimand visitors. Venezuelan Kirita is slightly more soft spoken, more flirtatious and curious than her American counterpart about the interactor's previous knowledge on her lessons, and on current topics outside her role. Brazilian Kira is very polite, assuming a more relaxed pace for the lesson and evaluation, rarely asks questions, and refuses to speak teenage lingo- although she understands it quite well.

IX and X.- Role and Role Dynamics:

What is the character's relation to the visitor? Each character is crafted with a role in mind, be it to advise, entertain, educate, guide, among others. In all of these applications, interacting with an animate character should provide a uniquely immersive and human experience, as much like reading a book or watching a film as it is like using a computer.

As character designers, we have a responsibility to ensure that the roles our characters are assigned to match each of the character's eight other characteristics to the best of our abilities, within the usual technical constraints, because we run the risk

of alienating users from interacting with any character after an unsatisfying exchange. For example, a talkative character with slow loading animations will not contribute to the user's experience in a efficiency-driven application, and may perhaps serve its advice purpose better through a text-based, emotionally muted response. Doyle (1999) explored the issue of where communicative characters may best showcase their abilities and pointed out that large-scale user testing with character tutors have shown that the mere presence of the character makes children more attentive and may lead to improved retention of the subject matter covered (Lester et al, 1997). Besides constraining the character's behaviors based on their role, we should also consider the constraints each role places onto the character and the communication patterns each role entails.

Janet Murray (1994) defined believability as directly linked to our familiarity with the interaction pattern portrayed and encouraged by the character while articulating character-design lessons from the success of Weizembaum's computer program Eliza. "Most people immediately know how to interact with [Eliza]. The psychiatric interview is a known pattern that people bring to the interaction." Therefore each role also carries with it a set of culturally defined patterns of interaction that direct the exchange between human interactor and character, and contribute to maintaining the deferment of questioning. Kyra's role is that of a teacher

or tutor, with the explicit goal of interesting young teenagers in art history and art appreciation.

The role of teaching young children may be perceived as offering little cultural variation, because our species' survival depends on the success of this cross-generational, one-on-one, affectively high teaching in a pattern that has existed for longer than the psychological interview pattern Murray considers so well known. Yet as we keep the tutoring role constant, teaching practices across cultures vary dramatically from each other even within the highly isomorphic national educational systems. Our Kyras predictably differ significantly in their role dynamics. American Kyra treats all interactors as playmates, occasionally teasing and cajoling the right answers from them ("Don't worry mortal, I won't use my powers against you if you choose wrongly!"), whereas Brazilian Kyra encourages her students from a respectful distance with: "Nao se preocupe se voce nao tem certeza de qual eh a pintura certa. Voce esta aqui para aprender." ("Don't worry if you are not sure which painting is the right one. You are here to learn.") Meanwhile, Venezuelan Kirita reassures her students by explaining what the goal of the assessment is: "Si no te la sabes, dímelo y asi yo sé por donde tenemos que empezar hoy la lección." ("If you don't know the answer, tell me so that I know where we should be starting the lesson today.")

Of particular interest as the first study to document such variation is the recently released video comparison on the teaching practices for mathematics on 231

eighth-grade classrooms during the 1995 school year. These classrooms were chosen among schools in Japan, Germany, and the United States as part of the Third International Mathematics and Science Study published by the U.S. Department of Education (Stigler et al., 1999). Not only are each educational system's requirements, teaching level, and lesson plans distinct, but even without these constraints, given free reign in their classrooms, teachers differed dramatically across national boundaries in terms of their pedagogical practices and goals, with surprising consistency within each national boundary.

Teachers in Germany and the United States emphasized teaching math skills, whereas Japanese teachers emphasized thinking. Accordingly, Japanese teachers organized their lessons to begin with a problem-solving session before revealing the lesson's concepts. Teachers in Germany and the U.S., in contrast, began each lesson with a concept acquisition phase and ended with a practice - or application - phase. German and American students, as a result, spent the majority of their working time in class practicing routine procedures, whereas their Japanese peers spent the majority of their time problem solving. Moreover, American teachers asked more yes/no questions than their German and Japanese counterparts, who tended to ask mostly explanation or description questions. Delivery of mathematical content also differed across countries, with only one fifth of the topics presented in the U.S. lessons

developed, in contrast to more than three fourths of the topics presented in German and Japanese classrooms.

RESEARCH DIRECTIONS.

Some of our group's previous work at Stanford University explored the use of characters as facilitators of second-language learning and cross-cultural communication through the child's emotional engagement with the characters, given the additional cultural context that rich animated characters can provide. *Tigrito* and the *Funki Buniz Playground*, at Stanford, focused the development on children beginning their foreign language development, while Extempo's *Foreign Language Online Workshop*, currently in development, is a character-based foreign language learning and practice environment aimed at more advanced adult learners.

Tigrito (Maldonado, Picard, Hayes-Roth, 1998a, Maldonado, Picard, Doyle, Hayes-Roth, 1998b) allows children to direct the interactions and spoken utterances of their avatar to push toys from different cultures, leveraging the critical sociolinguistic context for successful practice of second-language instruction in schools across the world (Pufahl, Rhodes, Christian, 2001). The autonomous and user-controlled characters in *Tigrito* have transient moods influenced by the child's actions and unique, culturally specific personalities, expressed through the distinctive ways the characters perform actions and interact with each other. The animated

characters' moods are displayed as sliders underneath the character (please see Figure 7.3) and influenced by the character's internal state, its perceptions of the other characters' actions, and may be directly controlled by the child through the sliders.

The characters' moods emulate those used in our group's earlier work, in particular, in the animated puppets of the *Virtual Theater* (Hayes-Roth and van Gent, 1996) varying along three continuous dimensions: an emotional one ranging from happy to sad, a physiological dimension ranging from peppy to tired, and a social dimension ranging from friendly to shy. We describe these independent moods to children as happiness, friendliness, and energy, and we use icons familiar to them such as smiley faces and batteries for happiness and energy, to label the sliders on the screen. Believability is maintained through avoidance of repetitive behaviors, dynamic mood changes with relation to the length of the interaction, physical exertion of the actions performed, and the interpretation of other character's actions. Each action performed or observed has an effect on the characters' moods, increasing or decreasing their happiness, friendliness, and energy in accordance with the personality of each character involved. By having each character attribute a distinct meaning both to its own actions and those of the other characters, we seek to mirror human interactions where two individuals may recognize the same action but interpret it differently, as is often the case among individuals from different backgrounds.

Figure 7.3: Tigrito at play:
Interaction of a user-controlled avatar with an autonomous character.



Children can interact through their tiger cub avatar with cubs controlled by other children, or autonomously driven by the engine, because *Tigrito* allows for three different modes of interaction between the child and on-screen characters: First-Person Mode, Avatar Mode, and Movie Mode. In the First-Person mode, children interact directly with the autonomous animated character of their choice, choosing actions to perform without an embodied presence in the virtual environment. In Avatar Mode (illustrated in Figure 7.3), the child directs the rightmost tiger in his interactions with the other character. This direction is delivered at a high level by moving the mood sliders below the child's avatar, and at a lower level by choosing

actions for the tiger to perform, using the buttons in the lower right corner of the screen. These action buttons reflect the interaction by changing dynamically in accordance with the tiger's moods, and represent appropriate actions from *Tigrito's* library. The character on the left in Figure 7.3 is an autonomous character whom children can only influence through their avatar's actions. If the child decides to make the autonomous character happier he or she can do so, both by improving their tiger's moods through the sliders, and by choosing friendlier actions that their tiger can perform for the autonomous character. In the Movie Mode, both characters are on the stage, and the child controls the characters through high level directions, solely by altering the moods of both characters through the corresponding sliders. In this third mode, the actions performed by the characters are left entirely up to the autonomous agents to choose, in accordance with their moods.

Exploring the premise that expression of the six basic emotions - anger, fear, sadness, surprise, happiness/enjoyment, and disgust - are recognized across cultures, although cultural variations exist in the perceived intensity with which each emotion is felt (Ewen, 1988), another of our projects, the *Funki Buniz Playground* (Maldonado and Picard, 1999), encourages cross-cultural play between children of varied cultural backgrounds. By focusing the interaction exclusively on the developing affective relationships – both in the virtual world between the characters, and in the real world between the children – the *Playground* provides us with a unique opportunity to study cross-cultural affective responses and bicultural empathy.

Figure 7.4: The Funki Buniz Playground



As can be seen in Figure 7.4, we opted to avoid a realistic representation of the characters within the *Playground*. Instead we designed a simple, cartoon like appearance for our characters' on-screen persona -- as if the children's own drawings were coming to life. Our *Playground* was designed for the *interactive mural* at Stanford University's iRoom (for further details on the iRoom implementation, please see Johanson, Fox, and Winograd, 2002). This large high resolution display features alternative input methods to the traditional keyboard, allowing for direct interaction with a pen, laser, or ultrasound devices, on the mural, since the current touch-screen technology is limited to smaller displays.

Because its particular physiognomy offered a natural mapping for the direct manipulation that the mural facilitates, we chose a rabbit for the lead role in our *Playground*. The traditional moods of the *Virtual Theater's* animated puppets, happiness, friendliness, and energy are represented through the rabbit's mouth, ears, and eyes, respectively. For example, friendliness is expressed by the degree to which the rabbit's long ears are open, and energy is expressed through the degree to which its eyes are open. Moreover, to model emotions believably, we linked these previously orthogonal mood dimensions in the underlying emotional model and displayed them accordingly on the character's facial features. Thus, when the Buni (as our young users referred to the rabbit characters) is angry, his ears are folded to denote a low friendliness level, his mouth set in a frown expressing unhappiness, and, additionally, his eyes slant in a suggestion of frowning.

The remaining direction control, action choosing, is similarly embedded; the top three most appropriate actions for the characters to execute are presented as three floating iridescent bubbles whose size reflects the appropriateness of the action contained. The bubbles reflect the constant dynamism of the character's moods, shrinking, growing, or popping as the appropriateness of the action they changes. As soon as a bubble pops, a new bubble is generated off screen and floats by, hovering above or to the side of the character.

Eliminating the linguistic content of the interactions proved key for the system's ability to explore cross-cultural affective responses, focusing the interaction exclusively on the developing affective relationships -- both in the virtual world, between the characters, and in the real world between the children. The consequences of this elimination extended even to the virtual environment, stressing its role to be not only that of a key player in maintaining the child's suspension of disbelief and sense of engagement, as well as the role of facilitating the cultural exchange. The stage grew beyond the traditional black-curtained enclosure into a grass-covered meadow, complete with blue skies, cotton clouds, and butterflies (see Image 4). As the implementation progressed, butterflies and clouds gained a life of their own, with the former drifting in and out of the children's field of vision at their own volition, and the latter's emulation of natural randomness in their formation pattern, let children recognize shapes and animals in the water masses.

By rendering the affective responses in the avatar's facial expressions and eliminating the linguistic content in action choosing and execution, as well as providing a dynamic and content-filled environment for the avatars, we aimed to engage five- to seven-year-old children who shared limited dominion of a common language in open-ended collaborative play, in the hopes that through this experience their understanding their cultural differences of would increase -- and maybe even be bridged.

In recent years, educational practice has shifted to emphasize constructivist learning in a discovery-based learning environment, and, simultaneously, recognizing the computer as an integral part of the schooling experience. Software characters allow us to carry this rich educational opportunity to a higher degree by adding a rich socio-cultural context and emotional motivation to the best pedagogical practices, with individualized, personally relevant content. As character designers, we may finally realize the potential of technology to offer a personalized learning experience, offering a range of representational models of concepts and events, as well as dynamic, adaptive assessment methods. Such a complete tutor (Gardner, 2000) would not displace the traditional teacher, but would complement the classroom interactions between students and teachers, as well as across the student body.

There is growing evidence to support such a role for characters: software agents have been shown to be successful tutors – in measures such as recall and problem-solving assessments, as well as likeability – when presenting curricular information through multiple modalities, such as text and voice, and when the characters’ speech is personalized to their interactor as well as self-referential (Moreno and Mayer, 2000). Moreover, just as with human tutors, software agents have been shown to be more effective at teaching when dispersing principle-based advice than when dispersing more task-specific advice (Lester et al., 1997). These studies are part of a growing trend in research efforts at comparing the relative

effectiveness of character coaching to that of traditional methods of instruction – such as books, workshops, and tutorials. Yet besides these traditional methods of assessment and measures of effectiveness, there may be an additional effect of lowering the learner’s anxiety and social cost of mistakes when interacting with a forgiving synthetic character tutor.

The convenience of learning anywhere, anytime on the web is propelling several e-learning initiatives towards employing characters as tutors for curricular content matter where the social relationship with the character may provide additional depth of understanding and greater motivation for the learner. Extempo’s *Foreign Language Online Workshop* (FLOW) is based on the premise that the unique expressive properties of animate characters can serve as catalysts of integrated language learning through verbal and affective interaction with learners (Hayes-Roth, Knodt, and Maldonado, 2002). Cultural nuances can be expressed through the key ten qualities identified earlier— not only to aid the learners in their foreign language acquisition and development, but also complement with a deeper understanding of the culture they are studying.

The gestures, beliefs, social roles, manners of speaking, and established norms of behavior are easily conveyed by characters designed to embody the best teaching principles, with the ability to repeat each interaction and explanation through different representations, until the learner masters the concepts and understands the culture.

One avenue of such an exchange that we are presently exploring involves a community of animate tutors, referring learners to each other based on the specific needs, proficiencies, learning style preference, and interests of each learner. The learner's personal coach introduces new vocabulary and materials, guides the learner through related exercises and activities, and also selects a conversation partner for the learner depending on proficiency and interests. These conversational partners are complete characters with roles of their own who introduce the daily practices of each culture to the learner's understanding and perceptions. Preliminary evaluations lead us to expect Extempo's FLOW improvisational characters to effectively supplement any language acquisition course and function competently in medium to advanced conversational practice.

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